



# Entering information into the European Drought Impact Report Inventory EDII

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# 1 Scope

## 1.1 Motivation

The inventory's objective is to compile knowledge on the impacts of historic and recent drought events from a variety of available information sources. Drought events are generally defined as a temporary, but sustained and regionally extensive occurrence of below average natural water availability. Drought may become a disaster only due to its impacts, and vulnerability to these impacts. The impacts of a drought event are often characterized by a particularly wide variety and high complexity. Commonly they are referred to as direct or indirect (primary or secondary), tangible or intangible, and economic, environmental or social impacts. They can span more than one sector.

The EDII (European Drought Impact Inventory) was established for the purpose of cross-disciplinary research on drought vulnerability and risk (STAHL ET AL., 2012). The inventory is intended to support drought research and is freely accessible to the public. The database infrastructure and first impact data collection campaigns have been a major collaborative effort within the DROUGHT-R&SPI project. It is our hope that the online EDII will now inspire public participation and the EDII will grow with time as more users participate in data collection, sharing, and analysis.

## 1.2 Impact definition

Several definitions of drought impacts can be found in the literature. For instance, KNUTSON ET AL. (1998) gave the following description of a drought impact:

*'A specific effect of drought. People also tend to refer to impacts as "consequences" or "outcomes." Impacts are symptoms of vulnerability.'*

and the US-Drought Impact Reporter operated by the National Drought Mitigation Center uses the definition of impact as

*'An observable loss or change that occurred at a specific place and time because of drought.'*

Following these definitions, the EDII primarily aims for **negative environmental, economic or social effects experienced under drought conditions**. That means precipitation shortfalls, anomalously low levels of soil moisture, water levels or stream flows alone/per se, i.e. without being associated with negative consequences (for water uses, ecosystems, agricultural yields etc.) or at least serious concerns, are not regarded as drought impacts to be registered in EDII. For this reason observations of such direct expressions of drought (low precipitation sums etc.) were not at all addressed in the categorization system used for entering EDII impacts (see [Annex 2](#)).

### Examples

For illustration, some examples of valid impact descriptions are:

- Significant harvest and income losses resulted from extreme drought in June and July in north western and north eastern Germany..
- Navigability was heavily impaired as the water level of the Elbe river at Dresden was almost as low as in the drought summer of 2003..
- Water use restrictions for several uses had to be imposed as water availability was down to 42% in early spring..
- Considerable problems where some fish species were threatened due to low wetland water levels during the drought ...

In contrast, insufficient impact information not meeting our understanding of impacts, because they miss a statement of negative consequences, are:

- extreme drought in June and July in north western and north eastern Germany
- the water level of the Elbe river at Dresden was almost as low as in the drought summer of 2003
- only 42% water availability in early spring
- wetland water levels slightly below the mean

Another issue related to the understanding of drought impacts often encountered is that many report sources, in particular agricultural reports, state only expectations (speculations) and estimates of potential impacts., e.g.:

- ...*expected* losses of 20% in crop productivity
- The drought in spring 2011 resulted in a delayed growth of winter wheat and a decreased development of crops later on. Although yields have developed average to slightly below average, a lower quality was *expected*.

While such information may be valuable to understand the seriousness and awareness of an emerging drought situation, unless the report clearly indicates that this speculation actually turned out to be true, such speculative reports should not be recorded as an impact into the EDII.

### 1.3 Prerequisites for entering EDII impact reports

Information entered into the EDII must stem from reports from reliable sources. A citation of your source of information must be provided. The effects of drought are complex and mostly depend on many factors. Thus, an important criterion for entering impacts to EDII is that **it must be unquestionable that the observed impact is caused by drought**. This implies that only records which were already declared drought impacts by the reliable source can be used.

All EDII impact report data are referenced in time and space, classified into pre-defined categories and described by short text. Hence, in order to submit an impact the source should allow you to determine at least the time (at least year), the location (at least country) and a short text description of the reported drought impact.

## 2 Using the Online Form

We kindly ask you to navigate through the online form's standardized interface to enter impact information. This procedure guarantees the best possible comparability and traceability of entries. Help text is available for most fields by clicking on the question mark. All information has to be entered in English.

Overview on obligatory requested input

- Basic information:
  - Information source
  - Reference
- Location:
  - Level of impact ( Country, NUTS1 , NUTS2, NUTS3)
  - Location, text description of the location
- Duration:
  - Date start, with month, season, year, whereas only year is obligatory
- Impacts:
  - Impact category
  - Impact type, multiple choices
  - Impact description, text description of the impact

## 2.1 Basic information

Unless the impact you report is based on your own observation, a reference to the source of the impact report is required. When entering information based on a specific source, please reflect closely the content of the original source.

Please start by indicating the **source of information** underlying your entry. Suitable source types are listed in the drop-down menu:

- Database
- Journal Article (scientific or professional journals)
- Book (Book Section)
- Newspaper Article
- Governmental Report (national and regional agencies/organisation)
- River Basin Organisation
- (Other) Government Document
- Report (by NGO)
- Report (private sector, e.g. insurance company)
- Press Release by stakeholders or agencies
- Thesis
- Pamphlet (e.g. information note by water supply company, city, etc.)
- Personal Observation
- URL (WWWPage)
- Map
- Other

After selecting the source type please provide a **reference** that is as complete as possible, ideally including name of the author, year, title of report, and additional information if available. This will help to assure the reliability and appropriateness of the source of information.

e.g.:

- *Affolter, P., U. Büntgen, J. Esper, A. Rigling, P. Weber, J. Luterbacher, and D. Frank (2010), Inner Alpine conifer response to 20th century drought swings, Eur J Forest Res, 129(3), 289-298.*
- *The Courier-Mail (Brisbane) 30 September 1947: Europe hit by drought. National Library of Australia <http://nla.gov.au/nla.news-article49328582>*

### 2.1.1 Spatial reference – Location

Please provide information on the location of the occurred impact. You will be asked to select the region where the impact was observed according to the NUTS system. The location classification is based on NUTS (Nomenclature of Units for Territorial Statistics), which is a hierarchical system for dividing the economic territory of the European Union and was established by Eurostat ([http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts\\_nomenclature/introduction](http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction)). There are different levels of spatial resolution (NUTS 1-3). The NUTS-1 level corresponds to the coarsest, the NUTS-3 level to the finest resolution.

For each drought impact report the most precise possible location information according to the available information should be entered, i.e. the NUTS region with the finest spatial resolution. However, if in doubt on the specific affected area please indicate the larger spatial unit only. However, **if a source specifies several impact locations that cannot be summarized adequately at the larger spatial unit, you should make separate impact report entries for each smaller unit!** The field 'location' in which you can type in text allows a more precise text description of a location to which the impact entry refers to (according to your underlying source of information). Some examples demonstrating the selection/indication of NUTS regions for impact reports with differences in the specification of location information can be found in [Annex 1](#). If the impact you are reporting relates to a **river** or **lake**, please choose the name from the list.

### 2.1.2 Temporal reference – Time and duration

Enter the date of the impact occurrence as detailed as possible according to the information stated in the original report source. The minimum date requirement is to specify the **year**. If possible also enter the **month** of the start and end of the reported impact. If your report source does not specify a month but refers to a season you can indicate this by using the field '**season**' instead of month. Hereby, 'winter' always refers to the season's end year, with e.g. 'winter' (season field) and '1983' (year field) referring to the winter season 1982/83 (~ Dec 1982 to Feb 1983).

In the field **related drought event** please select the event that led to the observed impact according to the underlying report source. In contrast to the actual timing of the reported impact to be entered previously, the naming of the related drought event in this field usually refers to established or commonly referred to reference events of long temporal and large spatial extent of the natural (meteorological) drought (e.g. 1992-94 Eastern Europe). If there is no well-suited event included in the selection list yet, you may add a new one.

### 2.1.3 Impacts Section

Each impact report is assigned to a specific impact category. EDII distinguishes 15 **impact categories** (available in drop-down menu in the impact submission form):

- 1 Agriculture and Livestock Farming
- 2 Forestry
- 3 Freshwater Aquaculture and Fisheries
- 4 Energy and Industry
- 5 Waterborne transportation
- 6 Tourism and Recreation
- 7 Public Water Supply
- 8 Water Quality
- 9 Freshwater Ecosystem: Habitats, Plants and Wildlife
- 10 Terrestrial Ecosystem: Habitats, Plants and Wildlife
- 11 Soil System
- 12 Wildfires
- 13 Air Quality
- 14 Human Health and Public Safety
- 15 Conflicts

Each impact category contains several sub-categories, called **impact types**. A table with the complete listing of the EDII impact categories and corresponding impact types is also included here, see [Annex 2](#).

Then, please enter a concise **text description of the impact**. If numbers on **economic loss**, **affected people** and/or **affected area** are provided in the source report, please enter these in the respective fields.

**Note:** You can select one impact category, but multiple types. If a report contains information on more than one impact category, you should make a new entry for the next impact category, i.e. enter those separately!

## 2.2 Additional Information

After entering the mandatory 'basic information' you may provide additional information. This section asks for further details that might be relevant information for the analysis of drought vulnerability and risk assessment. You are asked to optionally enter information such as the significance of related secondary impacts or response measures that go beyond the basic information covered by the preceding sections.

**Note:** Only if additional information is available in the report source tick the box 'additional information is available' and fill in the following fields! Otherwise you can leave the fields blank and directly submit your impact report.

### 2.2.1 Associated indirect/ secondary impacts

Drought impacts are often very complex and spread to sectors and regions not directly affected by the drought. Such indirect and intangible drought impacts may have even larger significance than first-order impacts, yet are much harder to capture. If such information is available in the original report source and relates to the impact reported in the previous sections, you may indicate this in the drop-down list (multiple choices possible):

- economic consequences beyond the reported impact
- lasting environmental impacts
- expansive effects on social life /public health

For instance, price effects for consumers and households are quite frequently reported secondary/indirect impacts, for which no specific EDII-impact-type fits. Increased prices for food and energy could be reported as secondary impacts of reduced agricultural productivity and impaired energy production respectively using the associated impact function. Further examples when and how the associated impact fields might be used can be found in [Annex 3](#).

**Note:** The associated impact fields should only be used if there are indirect/secondary impacts going beyond that what is well addressed by the impact category (primarily affected sector) and type in the main section, i.e. only if there is additional information on indirect/secondary impacts which cannot be classified as primary impact according to the available EDII-impact categories and types. If associated indirect/secondary impacts are indicated a short text description is necessary!

### 2.2.2 Response measures

Commonly drought impacts and related high-order impacts or response measures are interlinked, and their distinction is not straightforward. One person may regard something as an impact of drought that another would consider a response measure. The predefined **types of response measures** used in the EDII correspond to the broad classification of drought response measures used within the Drought R&SPI-Project (see DE STEFANO et al., 2012). Response measures should only be entered, if they are related ('in response') to the entered impact. Select the type(s) of the measures which were adopted (specifically) related to / in consequence of the reported drought impact in the drop-down list *and please note the brief description in italics given here:*

- **Preventive and strategic measures** (*developed and used under normal (pre-alert) conditions, aim to reinforce the structural system to increase its response capacity towards droughts*)
- **Education and awareness campaigns**
- **Water demand management** (*serve to control or influence the amount of water used - to decrease water use before, during or after drought periods - including, for instance, improving water use efficiency, water saving measures in different sectors, prioritization, reductions and restrictions of uses*)
- **Water supply management** (*aim at increasing the availability of water to be used*)
- **Environmental measures** (*aim at mitigating the impacts of drought on ecosystems*)
- **Recovery measures** (compensation schemes, ecosystem restoration) (*deactivation of adopted measures and the activation of restoration measures for the systems affected by drought*)
- **others**

**Administrative level of response measures:** Please select the level(s) of adopted response measures in the drop-down list. In order to select the appropriate option ask yourself *who* was responsible for managing or realizing the response measure (e.g. a governmental (national or regional) authority, local or regional volunteering groups, individuals affected by the drought):

- local activities
- regional / national measures
- international aid
- no information

**Related costs:** If information on the costs of the response measures is available (specified in the report source) please indicate the costs in the fields below (currency: €).

**Response description:** Please give a concise text description of the applied drought response measure!

Some examples of response measures are included in [Annex 4](#).

### 3 Copyright Issues

Inclusion of any information in the EDII database constitutes a form of publication. Therefore, contributors must be sure that anything they add has no copyright restriction. Short quotes are likely to be acceptable, however, the source of quotation must always be given. Members of the EDII team will routinely check submitted impact entries, and reserve the right to reject any entries if necessary.

### 4 Contact

We appreciate any questions or comments!

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# Annexes

## Annex 1 – Examples how to enter impact location information using the NUTS system

Impact description	Location (text field)	Country	NUTS-1	NUTS-2	NUTS-3	Remark
Sevilla city and its influence area (1200000 people) suffered water supply restriction during 10 hours a day during the summer. ...	Sevilla urban area	Spain	Sur;	Andalucia	Sevilla	The location given in the original source 'Sevilla city' is located in the Province called Sevilla corresponding to NUTS-3 level
Water supplies of the South West Water Authority in Devon were severely affected by drought and there was an increased ...	Devon	United Kingdom	South West	Devon		The given location Devon matches well with the NUTS-2 level region.
Water quality monitoring in reservoirs of the Guadalquivir River Basin showed...	Guadalquivir River Basin	Spain	Sur	Andalucia		The original source of information refers to the Guadalquivir River Basin. Watersheds mostly do not follow administrative borders (like the NUTS-system does), thus one first has to figure out, how the River basin is situated in relation to the NUTS-units. Since the Guadalquivir River almost completely lies within the autonomous community of Andalucia, it is correct to indicate that the reported impact affected (parts of) Andalucia and to select the NUTS-2 level Andalucia here.
Due to the drought, the farmers could only harvest grass ...	throughout the whole of the Netherlands	Netherlands				No NUTS-level was specified here, because according to the original source the entered impact affected the whole country
In Belgium low water levels led to a decreased navigability on several streams.	several streams in Belgium	Belgium				In contrast to the entry in the line above, here it is clear that only several streams (regions) within Belgium were affected by the impact, however the information to specify this further by using NUTS-level indication is not available.
Overall the drought in the transboundary basin of the Tagus river initiated renewed "water hostilities" were again the cause of political tension between Spain and Portugal (Llamas, 2000; see also López-Moreno et al., 2009).	transboundary basin of the Tagus River, political conflict between Spain and Portugal	Spain				Issues in the transboundary River basin Tagus led to conflicts between Spain and Portugal, thus impacted both countries at national level. Since it is not possible to select multiple countries for one entry, in this case it is suggested to enter the impact twice, for Spain as well as for Portugal
	transboundary basin of the Tagus River, political conflict between Spain and Portugal	Portugal				

## Annex 2 – EDII Impact Classification Scheme

Category	Type of impact
Agriculture & Livestock farming	1.1 Reduced productivity of annual crop cultivation: crop losses, damage to crop quality or crop failure due to dieback, premature ripening, drought-induced pest infestations or diseases etc.
	1.2 Reduced productivity of permanent crop cultivation
	1.3 Agricultural yield losses $\geq$ 30% of normal production (EU compensation threshold)
	1.4 Reduced availability of irrigation water
	1.5 Reduced productivity of livestock farming (e.g. reduced yields or quality of milk, reduced stock weights)
	1.6 Forced reduction of stock (early selling/slaughtering)
	1.7 Regional shortage of feed/water for livestock
	1.8 other
	1.9 Increased costs/economic losses
Forestry	2.1 Reduced tree growth and vitality
	2.2 Decrease in annual non-timber products from forest trees (e.g. cork, pine nuts, etc)
	2.3 Increased occurrence of water stress indicators and damage symptoms (e.g. premature ripening, seasoning checks, defoliation, worsened crown conditions etc.)
	2.4 Increase of pest / disease attacks on trees
	2.5 Increased dieback of trees
	2.6 Increased dieback of planted tree seedlings (in nurseries or afforested areas)
	2.7 Damage to short rotation forestry plantations (energy forestry)
	2.8 Other impacts
	2.9 Increased costs / economic losses
Freshwater Aquaculture and Fisheries	3.1 Reduced (freshwater) fishery production
	3.2 Reduced aquaculture production
	3.3 Other impacts
	3.4 Increased costs / economic losses
Energy & Industry	4.1 Reduced hydropower production
	4.2 Impaired production / shut down of thermal and nuclear power plants (due to a lack of cooling water and/or environmental legislation for discharges into streams)
	4.3 Restriction / disruption of industrial production process (due to a lack of process water and/or environmental legislation/restrictions for discharges into streams)
	4.4 Other impacts
	4.5 Increased costs / economic losses
Waterborne transport.	5.1 Impaired navigability of streams (reduction of load, river closure, increased need of interim storage of goods at ports)
	5.2 Other impacts (complete, if the impact is not listed above)
	5.3 Increased costs / economic losses
Tourism & Recreation	6.1 Reduced number of short-stay-tourists
	6.2 Reduced number of long-stay-tourists
	6.3 Golf courses or other sport facilities affected by a lack of irrigation water or/and a watering ban/a restriction on water use
	6.4 Impaired use / navigability of surface waters for water sport activities (including bans)
	6.5 Other impacts
	6.6 Increased costs / Economic losses
Public Water Supply	7.1 Local water supply shortage / problems (drying up of springs/wells, reservoirs, streams)
	7.2 Regional/region-wide water supply shortage/problems (drying up of springs/wells, reservoirs, streams)
	7.3 Bans on domestic and public water use (e.g. car washing, watering the lawn/garden, irrigation of sport fields, filling of swimming pools )
	7.4 Limitations in water supply to households in rural areas (supply cuts, need to ensure water supply by emergency actions)
	7.5 Limitations in water supply to households in urban areas (supply cuts, need to ensure water supply by emergency actions)
	7.6 other
	7.7 Increased costs / economic losses
Water Quality	8.1 Increased temperature in surface waters (close to or exceeding critical values)
	8.2 (Temporary) water quality deterioration/problems in natural surface waters (streams and lakes) or reservoirs (e.g., significant change of physio-chemical indicators, increased concentrations of pollutants, decreased oxygen saturation levels, eutrophication, algal bloom)
	8.3 (Temporary) impairment of ecological status of surface waters (according to EU Water Framework Directive)
	8.4 (Temporary) impairment of chemical status of surface waters (according to EU Water Framework Directive)
	8.5 Increased salinity of surface waters (saltwater intrusion and estuarine effects)
	8.6 (Temporary) water quality deterioration/problems in ground water
	8.7 Increased salinity of groundwater
	8.8 Problems with drinking water quality (e.g., increased treatment, breaking of standards)
	8.9 Problems with bathing water quality (e.g. bathing bans)
	8.10 Problems with irrigation water quality
	8.11 Problems with water quality for use in industrial production processes
	8.12 Other impacts
	8.13 Increased costs / economic losses

Freshwater Ecosystems: Habitats, Plants and Wildlife	9.1 Increased mortality of aquatic species	
	9.2 Increased species concentration near water	
	9.3 Migration and concentration (loss of wildlife in some areas and too many in others)	
	9.4 Increased populations of invasive (exotic) aquatic species	
	9.5 Observation of adverse impacts on populations of rare/endangered (protected) riparian species	
	9.6 Observation of adverse impacts on populations of rare/endangered (protected) species of wetlands	
	9.7 Loss of biodiversity (decrease in species diversity)	
	9.8 Danger for or actual violation of minimum flow or environmental flow requirements	
	9.9 Drying up of shallow water areas, weed growth or algae bloom	
	9.10 Drying up of perennial stream sections	
	9.11 Drying up of lakes and reservoirs (which have a habitat function)	
	9.12 (Mid-/Long-term) deterioration of wetlands	
	9.13 Irreversible deterioration/loss of wetlands	
	9.14 other	
	9.15 Increased costs/economic losses	
Terrestrial Ecosystems: Habitats, Plants and Wildlife	10.1 Increased species mortality	
	10.3 Changes in species biology/ecology	
	10.4 Loss of biodiversity (decrease in species diversity)	
	10.5 Shift in species composition	
	10.6 Reduced plant growth	
	10.7 (Mid-/Long-term) deterioration of habitats	
	10.8 Irreversible deterioration/loss of habitats	
	10.9 Lack of feed / water for terrestrial wildlife	
	10.11 Increased attacks of pests and diseases	
	10.12 Increased contact of wild animals under stress (shortage / lack of feed and water) with humans/ human settlements	
	10.13 Other impacts	
	10.14 Increased costs / economic losses	
	Soil System	11.1 Drought-related erosion processes (loss of soil fertility)
		11.2 Structural damage to private property due to soil subsidence/shrinkage
11.3 Structural damages on infrastructures due to soil subsidence/shrinkage		
11.4 Other impacts		
11.5 Increased costs / economic losses		
Wildfires	12.1 Increased burned area	
	12.2 Increased number of wildfires	
	12.3 Increased severity of wildfires	
	12.4 Increased costs / economic losses	
Air Quality	13.1 Air quality pollution effects / problems (dust bowl effect, wildfires, substitution of hydropower production by fossil energy)	
	13.2 Other impacts	
	13.3 Increased costs / economic losses	
Human Health & Public Safety	14.1 Heat stress problems (if drought is associated with a heat wave)	
	14.2 Increased respiratory ailments (heat wave and air quality)	
	14.3 Excess mortality during heat waves	
	14.4 Drought induced public-safety issues (e.g. increased risk of structural damages)	
	14.5 other	
	14.6 Increased costs/economic losses	
Conflicts	15.1 Water allocation conflicts - international	
	15.2 Regional/local user conflicts	
	15.3 Other (drought-induced) conflicts	

## Annex 3 – Examples when to use the associated impacts field

Impact			Associated (indirect/secondary) impacts	
Category	Type	Description	Type	Description
1 Agriculture & Livestock Farming	1.1 Reduced productivity of annual crop cultivation. 1.3 Agricultural yield losses >= 30% of normal production (EU compensation threshold) 1.5 Reduced productivity of livestock farming 1.6 Forced reduction of stock(early selling/slaughtering) 1.7 Regional shortage of feed/water for livestock 1.9 Increased costs/economic losses	Irregular and far below average precipitation proved devastating for both winter and summer crops. In addition, air temperatures have been significantly higher than the long term average. Cereal production was down by 63 percent compared to 2006, and about 70 percent lower than the average of the previous five years. Lack of pasture/fodder and the need to purchase increasingly expensive food have forced the majority of households to sell a substantial share of their livestock, notably cattle, but also pigs and sheep.	<b>Economic consequences beyond the reported impact;</b> <b>Expansive effects on social life</b>	Special report by FAO about its Mission to Moldova because of the drought in 2007: "The share of total lending going to the agricultural sector is relatively small, but small farmer associations and limited liability companies had borrowed from banks, Savings and Loans Associations, and from agricultural input suppliers. Debt outstanding is on the order of US\$30.5 million for small farms and associations, and over US\$100 million for Enterprises and Corporations. Unless loans are re-scheduled a failed cropping season may be followed by a delayed or sharply curtailed one. Reduced yields in winter crops and summer crops affected overall production and drastically reduced returns on leased land and on labor to the majority of small holders, who usually receive in-kind payments of wheat, corn, oil. Household production from home gardens, a mainstay of food supply for most rural families (70 percent of population) was also down sharply. To maintain the national food balance, commercial wheat imports, including for emergency stock build-up, are expected to reach about 237 000 tons. With greater damage to summer crops, and in spite of the reduction of the national livestock herd, maize imports are likely to be much higher, perhaps as much as 500 000 tons. Some of this will be for human consumption, but most of the maize imports will be for livestock feed. Even with adequate overall supply, food prices will remain high or rise further. With already stressed household budgets, food access is likely to decrease for the poorer part of the population."
4 Energy & Industry	4.1 Reduced hydropower production 4.5 Increased costs/economic losses (for energy sector)	17% reduction in energy from hydroelectric power plants due to the drought and increase use of fossil fuel for electricity	<b>Economic consequences beyond the reported impact</b>	Increase in demand of annual licenses for CO2 emissions (exceed the limits of the national plan for allocation of emission licenses); increase costs due to price increase of the CO2 emission licenses; for compensation of the increase in use of fossil fuel instead of hydropower: 182Meuros
1 Agriculture & Livestock Farming	1.4 Reduction of cultivated areas due to a lack of irrigation water	As a direct consequence of water shortage irrigation water availability was heavily restricted in, thus the irrigated land in the drought years decreased by 50%. In some areas, water was mainly reserved for the irrigation of irrigated tree groves in order to sustain trees only instead of saving production; farmers were severely discouraged from planting summer crops.	<b>Lasting environmental impacts</b>	The water shortage situation especially in agricultural production led to strongly increased exploitation of groundwater resources. In consequence of lacking irrigation water many new (illegal, unrecorded) wells were dug, however it is impossible to accurately assess their contribution to the overexploitation process. In most affected areas, drought effects on water resources persisted long after termination of the event. Overexploitation resulted in saltwater intrusion in coastal aquifers in the South and adverse effects on wetlands.
7 Public Water Supply	7.1. Local water supply shortage / problems (drying up of springs, wells, streams, reservoirs) 7.4. Limitations in water supply to households in rural areas 7.5. Limitations in water supply to households in rural areas 7.7. Increased costs / economic losses	Drying up of small water sources, drying up of wells and springs had negative impacts on more than 94 372 inhabitants; drying up of wells and groundwater pumping sites impacted 44 municipalities in August; water transportation (with water tank) affected 66 municipalities in August; shortage of water supply affected 37 municipalities in August.	<b>Expansive effects on social life / public health</b>	The interruptions of water supply for more than 12 hours in most municipalities located in Alentejo region, which required the implementation of alternative systems for water supply (e.g. water tanks) were regarded as the most serious impacts of the drought event impacting daily live heavily. In addition a high number of hepatitis A and other salmoneloses was observed probably associated with the use of water form alternative sources, in particular well, springs and fountains not monitored for water quality.

## Annex 4 – Examples of response measures

Impact Type	Response measure Type of measure	Administrative level	Description	Related costs
7.2 Regional/region-wide water supply shortage/problems 7.4 Limitations in water supply to households in rural areas	<b>Preventive and strategic measures;</b> <i>(Water supply management)</i>	Regional/national measures	Water shortage situation occurred in Vorarlberg during the drought event of 2003. Already before the <u>drought</u> the 'Vorarlberger Trinkwasserkonzept' (a long-term concept concerning the drinking water supply of the Vorarlberg region) was initiated which aims at documenting all available water resources and supply (distribution) structures in order to tackle issues of drinking water supply safety, drinking water emergency supply concept and region-wide transfer systems and finally optimize the safety of supply.	
7.2 Regional/region-wide water supply shortage/problems	<b>Education and awareness campaigns;</b> <i>(Water demand management)</i>	No information	Call-to-Save-Water-Flyers were distributed among the population	
1.7 Regional shortage of feed/water for livestock	<b>Education and awareness campaign</b>	Regional / national measures	Governmental campaign: advises farmers to press straw (not to use it as much alike in usual years) in order to use it for animal feeding to compensate for the lack of fodder	
7.1 Local water supply shortage / problems (drying up of springs/wells, reservoirs, streams)	<b>Water demand management</b>	Local activities	Restriction in water use for irrigation due to insufficient water for both, irrigation and urban supply (from Redondo and Reguengos de Monsaráz municipalities)	
7.2 Regional/region-wide water supply shortage/problems 7.4 Limitations in water supply to households in rural areas 7.5 Limitations in water supply to households in urban areas	<b>Water demand management;</b> <b>Water supply management</b>	Regional / national measures International aid	In 2008, Cyprus suffered a fourth consecutive year of low rainfall and the drought situation reached a critical level in the summer. To ease the water crisis, 30 tankers delivered water from Greece and households were supplied with water for around twelve hours only three times a week. The government applied for financial assistance from the EU Solidarity Fund to help respond to the crisis, which had associated costs equivalent to an estimated 1.25 % of the country's gross national income (GNI). The European Commission agreed to grant EUR 7.6 million in aid from the EU Solidarity Fund.	
7.2 Regional/region-wide water supply shortage/problems 7.4 Limitations in water supply to households in rural areas 7.5 Limitations in water supply to households in urban areas	<b>Water supply management</b>	Regional / national measures	During the 2004-2006 drought, Portugal had to spend 23 Mio € in urban water supply. In 66 municipalities (100 500 inhabitants), urban <u>water supply was supplemented</u> by 22 850 water tank operations	23 000 000
7.2 Regional/region-wide water supply shortage/problems	<b>Water supply management</b>	Regional / national measures	Additional old boreholes have been brought into use to guarantee water supplies.	
4.4 Other impacts 4.5 Increased costs / economic losses	<b>Water supply management</b>	Regional / national measures	Emergency overland pipelines were installed and new wells for private water abstraction were drilled to maintain industrial water supplies.	
1.4 Reduction of cultivated areas due to a lack of irrigation water	<b>Water supply management</b>	Regional /national measures	Water transfer from other reservoirs within the same river basin to supply this irrigated system.	
9.8 Danger for or actual violation of minimum flow or environmental flow requirements	<b>Environmental measure;</b> <b>Water supply management</b>	Regional /national measures	A transfer scheme managed by the Environment Agency has pumped 3,334 million gallons of water since the end of May to keep two major Lincolnshire rivers flowing. The Trent Witham Ancholme River Transfer Scheme takes water from the River Trent into the River Witham and then pumps it along a 17km underground pipeline to support water levels in the River Ancholme.	
9.8 Danger for or actual violation of minimum flow or environmental flow requirements	<b>Environmental measure;</b> <b>Water demand management</b>	Regional /national measures	The governmental water management office recommended the Landratsamt Kitzingen, the Landratsamt Main-Speassart and the Landratsamt Würzburg to temporarily forbid all water abstractions from surface waters.	
9.1 Increased mortality of aquatic species 9.10 Drying up of perennial stream sections	<b>Environmental measure</b>	Local activities	Because many small mountain creeks were drying up and fish kill was observed a local organization for sport fishing realized a rescue fishing and translocation action for three creeks.	

<b>Impact Type</b>	<b>Response measure Type of measure</b>	<b>Administrative level</b>	<b>Description</b>	<b>Related costs</b>
8.1 Increased temperature in surface waters 8.2 (Temporary) water quality deterioration/problems in natural surface waters or reservoirs 8.3 (Temporary) impairment of ecological status of surface waters (according to EU WFD)	<b>Preventive and strategic measures; Environmental measure</b>	Regional /national measures	If oxygen concentrations dropped below 4 mg/l, mitigation measures for promoting the aeration were initiated in order to prevent a further decline of the oxygen concentrations and possible fish kill. Measures were applied at many places. In total the duration of aeration measures from June to August was 464 hours. There were 12 preventive actions and 2 emergency measures which lasted for at least 24 hours. At 6 events the duration of the aeration measures was 48 hours. All measures were carried out according to the "oxygen regulations for the River Neckar", which had been elaborated before 2003 since critical oxygen situations have been a known problem in the Neckar. However, in comparison to previous years the mitigation efforts were very comprehensive."	
9.1 Increased mortality of aquatic species 9.4 Increased populations of invasive (exotic) aquatic species	<b>Environmental measure</b>	Local activities; Regional / National measures	Harvesting of exotic fish species by local and regional authorities in seven reservoirs that attained critical water levels for fish survival and water quality in order to mitigate effects on endemic species	290000
1.1 Reduced productivity of annual crop cultivation. 1.3 Agricultural yield losses >= 30% of normal production (EU compensation threshold) 1.5 Reduced productivity of livestock farming 1.6 Forced reduction of stock(early selling/slaughtering) 1.7 Regional shortage of feed/water for livestock 1.9 Increased costs/economic losses	<b>Recovery measures</b>	International aid	In response to a request by the president of the Republic of Moldova to the UN Secretary-General and to the Director-General of FAO, an FAO/WFP Crop and Food Supply Assessment Mission (CFSAM) visited Moldova between 13 and 22 August 2007. The Mission was requested to assess the impact of the drought on the agricultural and livestock sectors as well as the population at large. In addition, the Mission was <u>tasked to devise immediate and medium-term rehabilitation measures</u> to mitigate the impact of drought. Urgent measures to be taken include the provision of agricultural inputs for October planting, subsidies for livestock feed, in order to prevent any further de-stocking, relief on land taxes and essential food import duties, and stepping up social assistance programs	
1.1 Reduced productivity of annual crop cultivation 1.2 Reduced productivity of permanent crop cultivation 1.9 Increased costs/economic losses	<b>Recovery measures</b>	Regional / national measures	The drought losses compensated to farmers from the state budget in 2000 were as high as around 5 billion Czech crowns (approximately 185 million Euros).	185 000 000
11.3 Structural damages on infrastructures due to soil subsidence/shrinkage	<b>Recovery measures</b>	Regional / national measures	In a peat dike fractures of 350 meter were found. The peat dikes dehydrated during the drought and become too light, whereby fractures developed. The dike is repaired and will be irrigated.	
2.3 Increased occurrence of water stress indicators and damage 2.4 Increase of pest / disease attacks on trees 2.5 Increased dieback of trees	<b>Recovery measures</b>	Regional / national measures	Financial support for heavily affected / damaged private forests	